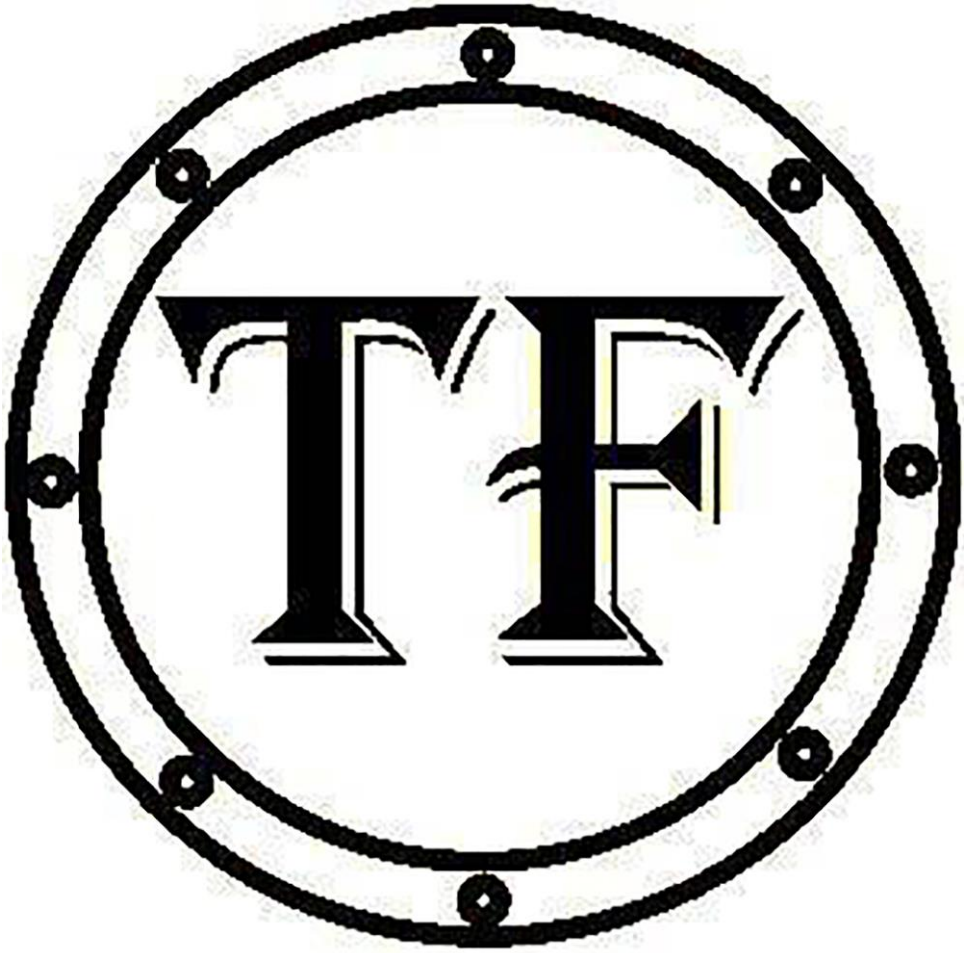
What is the Function of a flange and How Does it Work?

The flange industry is wide, and it offers customers a reliable way to connect pipe systems with the various valves, equipment, and other components of virtually any processing system. Flanges are the second most used joining method after welding.



What a Flange is?

A flange is a crucial component in piping and engineering systems. The flange meaning refers to a flat, disc-shaped piece used to connect pipes, valves, pumps, or other equipment.

Flanges provide easy access for cleaning, inspection, or modification of a system. They are typically bolted together and sealed with gaskets to ensure a tight connection.

Understanding what is a flange is essential in industries like construction, oil, and gas. Flanges come in various types, such as weld neck, slip-on, and blind, to meet different requirements.

If you use flanges, it adds flexibility when you need to maintain piping systems. It also allows for easy disassembly and improved access to system components.

A typical flanged connection is composed of three parts:

- Bolting
- Gasket
- Pipe flanges

In many cases, specific bolting and gasket materials are made from the same or approved materials as the piping components you wish to connect. For example, stainless steel flanges are the top choice among some of the most common flanges. However, flanges are available in a wide range of materials, so matching them with your needs is crucial.

Other common flange materials include Chrome Moly, Inconel, Monel, and many others, depending on the application.

The best option for your needs depends on the system in which you intend to use the flange and your specific requirements.

Common flange types and characteristics

Flanges are not a one-type-fits-all kind of solution. If we keep the sizing aside, matching the ideal flange design to your piping system and intended usage will help to ensure optimal pricing, a long service life, and reliable operation.

Here are the most commonly available flange types:

Threaded flanges

It is also known as a screwed flange and has a style with thread inside. The flange bore fits with the matching male thread on the fitting or pipe.

The threaded connections mean you can avoid welding in many use cases. If you simply match the threading o the pipes, you wish to connect.

Socket-weld flanges

Ideal for small pipe diameters in low-pressure and low-temperature scenarios, socket-weld flanges feature a connection where you place the pipe into the flange and then secure the connection with a single multi-pass fillet weld.

As a result, it makes the style simpler to install compared to other welded flange types while avoiding the limitations associated with the threaded ends.

Slip-on flanges

Slip-on flanges are quite common and are available in large-size ranges. It can accommodate systems with high flow rates and throughput.

You intend to connect if you match the flange to the outer pipe diameter. Installation is slightly more as you will need to fillet the weld on both sides to secure the pipe flange.

Lap joint flanges

Lap joint flanges require butt welding of the stub end to the fitting or pipe with a backing flange to create a flanged connection.

The design makes this style popular for use in systems with physical systems or space that requires frequent maintenance and dismantling.

Weld neck flanges

Weld neck flanges need butt welding for installation. However, its performance, integrity in the systems with multiple repeat bends,

and the ability to use them at high temperatures and high pressure make them a top choice for processing piping.

Blind flanges

Useful for isolation or terminating piping systems, blind flanges are essentially boltable blank discs.

When you install them properly and combine them with the correct gaskets, it can achieve an outstanding seal that is easy to remove when needed.

Specialty flanges

The flanges types listed above are quite common. However, various specialized flange types are available to suit various environments and uses.

Other options include reducing flanges, orifice, expanding flanges, weld flanges, and nipo flanges.

Flange Facing Types: Making the connection

The design is just a start when you consider the ideal flange for your piping system. Face types are another characteristic that greatly impacts your flanges' service life and final performance.

Facing types determine the gaskets required to install the characteristics and the flange related to the seal created.

Common face types include:

- Flat Face (FF)
- Raised Face (RF)
- Ring Joint Face (RTJ)
- Tongue and Groove (T&G)
- Male & Female (M&F)

Most face types offer one of the two finishes: smooth or serrated. Choosing between the options is crucial as it will determine the optimal gasket for a reliable seal.

In general, smooth faces work best with metallic gaskets, while serrated faces help create stronger seals with soft material gaskets.

Flanges Dimensions: The Proper Fit

Apart from the functional flange design, flange dimensions are the most likely factor that impacts the flange choices when updating, maintaining, or designing a piping system.

First, however, you must consider how the flange interfaces with the pipe and the gaskets in use to ensure proper sizing.

Common considerations include:

- Nominal bore size
- Pipe size
- Bolt circle diameter
- Thickness
- Outside diameter

Flange classification and service ratings

The above characteristics will influence how the flange performs across various environments and processes.

Flanges are often classified based on their ability to withstand pressures and temperatures. It is designated using a number and either ‘class,’ ‘lb,’ or ‘#’ suffix. These suffixes are interchangeable but will differ based on the vendor or region.

Common classifications include:

- 150#
- 300#
- 600#
- 900#
- 1500#
- 2500#

Flange markings and standards

To make the comparison easy, flanges fall under global standards established by the ASME (American Society of Mechanical Engineers) – ASME B16.5 & B16.47.

If you are attempting to verify or replace the existing parts, all flanges must include the markers, typically on their outer perimeter, to aid in the process.

Conclusion

The above guide offers you a solid foundation of the basics of flange design and how to choose the ideal flange for your piping system.

However, with a wide range of stainless steel flanges or other available flange materials, it is impossible to list every consideration, detail, or configuration.